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TELEVISION IN THE USSR, 1925-1947

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[A Digest]

The first section of this paper includes a discussion of the basic principles of television, including definition, number of frames, contrast, signal-to-noise ratio, sensitivity, frequency bands, etc. The development of television is then traced briefly in two stages: from 1925 to 1932, and from 1932 to the present. The operating principle of Zworykin's iconoscope, which marked the opening of the second period, is discussed in detail.

In a certificate of authorship, granted P. V. Shamov in 1933, two methods of increasing the sensitivity of the iconoscope were pointed out. The first proposal concerned replacing the dielectric of the mosaic with a semiconductor of low specific conductivity. If an additional voltage source, negative with respect to the signal plate, is connected in series with the mosaic, then, as a result of the conductivity of the mosaic, an accelerating field drawing off secondary electrons and photoelectrons can be formed between the mosaic and the collector.

The second proposal concerned the separation of the mosaic's functions and taking the electronic image from a separate photocathode on the mosaic. Under these conditions, the mosaic is used only for the storage of charges. The image iconoscope (US) or superemitron (England) was developed on this principle. The development of the orthiconiscope by RCA is then discussed.

Elementary considerations governing the selection of the number of frames and number of scanning lines are taken up next. At present, 625-line scanning is envisaged as the new standard for the Soviet Union.

There is no difficulty now in obtaining small pictures of the order of 240 by 180 millimeters. However, obtaining large pictures, of the order of 10 to 20 square meters, is a problem which has not been completely solved. Separate units with a large screen have been made. Two basic principles are used in these units.

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The first principle consists in the optical projection on the screen of a small but very bright picture obtained in a special cathode-ray projection tube. Great difficulties are encountered in the use of this principle, due to the power dissipation on the screen of the tube which operates at voltages exceeding 100 kilovolts. The time of service of these projection tubes is very short because of such forced operation.

The second principle makes use of an ultrasonic modulator illuminated by a powerful secondary light source. The large-screen units constructed on this principle obtain a relatively large picture but the picture quality is not very good. Moreover, in these units the pictures are synthesized by mechanical scanning devices and a complex optical system.

An unusual solution of the large-screen problem may be anticipated by using the properties of halogen salt crystals which color under the action of an electron beam. This work, however, has not yet led to any definite results.

One system of color television, which is in experimental operation, is discussed. This is the usual electronic system, supplemented by three special light filters rotating synchronously in front of the orthiconiscope and the screen of the receiving tube. The fields of the three basic colors are transmitted alternately in a definite sequence. The number of complete frames is 40, the number of color fields 120.

The problem of synchronizing the receiver with the transmitter is discussed briefly. The problem of synchronization may be considered solved, with the exception of especially difficult cases of intense industrial noise.

In discussing the uses of television, the fact that two transmitting television centers, in Moscow and Leningrad, were put into operation late in 1938 is mentioned. Those were deactivated during World War II, and the Moscow television center has only recently resumed operation. The real problem, however, is that of making a cheap, simple television receiver so that television will be accessible to the masses. The production of such a receiver is difficult for a number of reasons, including the low amplification given by the separate receiver stages, and the necessity for uniting the two receivers for video signals and for sound into one.

It is then pointed out that the use of a great number of individual television receivers presents certain difficulties. The field intensity diagram of a telecenter in a large city is of very uncertain form due to the reflection and absorption of ultrashort waves by buildings. Reception is practically impossible at some points. Thus, great interest was devoted to the home television receiving-distributing stations designed and put into operation in Moscow before the war. The receiving-distributing station consists of a receiver placed in a special loft, as close as possible to the antenna, and a number of subscribing units connected with the receiver by telephone lines. The subscribing units (repeaters) are very simple and cheap since the majority of functions are executed by the receiver. The use of such receiving-distributing stations in large city homes has a definite future.

The use of radio-relay lines and cable lines is discussed in connection with the line-of-sight limit on reception. The radio-relay lines (repeater stations) make use of wave lengths from several decimeters up to one meter, thereby decreasing the transmitter power required and increasing directivity. It is still difficult to compare cable communication with radio-relay lines, but they will probably develop together and sometime supplement each other, depending on the type of terrain between the two points to be bridged. The suggested use of an airplane to implement television transmission is noted.

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The use of television as a method of communication has important military applications. Television communication from a scout plane or "korrektirovshchik" with a ground point or ship would make it possible to observe, in the command point or staff, objects 200-300 kilometers away. The present status of television engineering makes it possible to design television transmitting stations in airplanes, with definition up to 1,000 or more lines, which would be very small and weight little.

The use of television transmitters in guided aerial bombs and torpedoes has become feasible in recent years, due to the development of suitable miniature television transmitters. These could then be guided from the mother airplane while observing the target on the screen of the receiver.

Video-telephone equipment was in use before the war. Several such units were designed for communication between the Palace of the Soviets, and a number of government insitutions. A number of other possible television uses are mentioned, including underwater television units and remote observation of surgical operations.

It is difficult to say which of these uses of television is the most promising, but undoubtedly television broadcasting and television communication represent the most up-to-date and perfected forms of communication techniques.

The Five-Year Plan provides for the modernization of the Moscow television center and the construction of new television centers in Leningrad, Kiev, and Sverdlovsk. A number of plants must begin the production of television receivers. Thus, by 1950, the foundation will be laid for the conversion to television broadcasting.

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